CLAIMS

What is claimed is:

1. An optical device, comprising:

a first polarization beam splitter (PBS);

a first set of optical rotators optically coupled to the first PBS at a face intersecting a first axis of the device, the first set of optical rotators comprising a first non-reciprocal optical rotator (NRR) and a first reciprocal optical rotator (RR);

a second PBS optically coupled to the first set of optical rotators at a side opposite to the first PBS;

a first reflection interferometer (RI) optically coupled to the second PBS at a face intersecting a second axis of the device, wherein the second axis is not parallel to the first axis;

a second RI optically coupled to the first PBS at a face intersecting a third axis of the device, wherein the third axis is not parallel to the first axis;

a second set of optical rotators optically coupled to the second PBS at a side opposite to the first RI, the second set of optical rotators comprising a second NRR and a second RR;

a third PBS optically coupled to the second set of optical rotators at a side opposite to the second PBS; and

a third RI optically coupled to the third PBS at a side opposite to the second set of optical rotators.

2. The device of claim 1, wherein the first NRR is optically coupled to the

second PBS at the face intersecting the first axis and the first RR is optically coupled to the first NRR at a side opposite to the second PBS.

3. The device of claim 1, wherein the second NRR is optically coupled to the second PBS at a side opposite to the first RI and the second RR is optically coupled to the second NRR at a side opposite to the second PBS.

4. The device of claim 1, further comprising:

an input optical port optically coupled to the first PBS at a side opposite to the first set of optical rotators;

a drop optical port optically coupled to a face of the first PBS at a side opposite to the second RI;

an output optical port optically coupled to the second PBS at a side opposite to the first set of optical rotators; and

an add optical port optically coupled to the third PBS at a face not intersecting the second axis of the device.

5. The device of claim 1, further comprising:

a third set of optical rotators optically coupled to the first PBS and the second RI, the third set of optical rotators comprising a third NRR and a third RR.

6. The device of claim 5, wherein the third NRR is optically coupled to the first PBS at a face intersecting the third axis and the third RR is optically coupled to the third

NRR at a side opposite to the first PBS.

7. The device of claim 5, further comprising:

a fourth set of optical rotators optically coupled to the third PBS and the third RI, the fourth set of optical rotators comprising a fourth NRR and a fourth RR.

8. The device of claim 7, wherein the fourth NRR is optically coupled to the third PBS at a side opposite to the second set of optical rotators and the fourth RR is optically coupled to the fourth NRR at a side opposite to the third PBS.

9. An optical device, comprising:

a first PBS;

a first set of optical rotators optically coupled to the first PBS at a face intersecting a first axis of the device, the first set of optical rotators comprising a first NRR and a first RR;

a second PBS optically coupled to the first set of optical rotators at a side opposite to the first PBS;

a first RI optically coupled to the second PBS at a face intersecting a second axis of the device, wherein the second axis is not parallel to the first axis;

a second RI optically coupled to the first PBS at a face intersecting a third axis of the device, wherein the third axis is not parallel to the first axis;

a second set of optical rotators optically coupled to the second PBS at a side opposite to the first RI, the second set of optical rotators comprising a second NRR and a second RR;

a third PBS optically coupled to the second set of optical rotators at a side opposite to

the second PBS;

a third RI optically coupled to the third PBS at a side opposite to the second set of optical rotators; and

a third set of optical rotators optically coupled to the first PBS and the second RI, the third set of optical rotators comprising a third NRR and a third RR.

10. The device of claim 9, wherein the first NRR is optically coupled to the second PBS at the face intersecting the first axis and the first RR is optically coupled to the first NRR at a side opposite to the second PBS.

11. The device of claim 9, wherein the second NRR is optically coupled to the second PBS at a side opposite to the first RI and the second RR is optically coupled to the second NRR at a side opposite to the second PBS.

12. The device of claim 9, wherein the third NRR is optically coupled to the first PBS at a face intersecting the third axis and the third RR is optically coupled to the third NRR at a side opposite to the first PBS.

13. The device of claim 9, further comprising:

an input optical port optically coupled to the first PBS at a side opposite to the first set of optical rotators;

a drop optical port optically coupled to a face of the first PBS at a side opposite to the second RI;

an output optical port optically coupled to the second PBS at a side opposite to the first set of optical rotators; and

an add optical port optically coupled to the third PBS at a face not intersecting the second axis of the device.

14. An optical device, comprising:

a first PBS;

a first set of optical rotators optically coupled to the first PBS at a face intersecting a first axis of the device, the first set of optical rotators comprising a first NRR and a first RR;

a second PBS optically coupled to the first set of optical rotators at a side opposite to the first PBS;

a first RI optically coupled to the second PBS at a face intersecting a second axis of the device, wherein the second axis is not parallel to the first axis;

a second RI optically coupled to the first PBS at a face intersecting a third axis of the device, wherein the third axis is not parallel to the first axis;

a second set of optical rotators optically coupled to the second PBS at a side opposite to the first RI, the second set of optical rotators comprising a second NRR and a second RR;

a third PBS optically coupled to the second set of optical rotators at a side opposite to the second PBS;

a third RI optically coupled to the third PBS at a side opposite to the second set of optical rotators;

a third set of optical rotators optically coupled to the first PBS and the second RI, the third set of optical rotators comprising a third NRR and a third RR; and

a fourth set of optical rotators optically coupled to the third PBS and the third RI, the fourth set of optical rotators comprising a fourth NRR and a fourth RR.

15. The device of claim 14, wherein the first NRR is optically coupled to the second PBS at the face intersecting the first axis and the first RR is optically coupled to the first NRR at a side opposite to the second PBS.

16. The device of claim 14, wherein the second NRR is optically coupled to the second PBS at a side opposite to the first RI and the second RR is optically coupled to the second NRR at a side opposite to the second PBS.

17. The device of claim 14, wherein the third NRR is optically coupled to the first PBS at a face intersecting the third axis and the third RR is optically coupled to the third NRR at a side opposite to the first PBS.

18. The device of claim 14, wherein the fourth NRR is optically coupled to the third PBS at a side opposite to the second set of optical rotators and the fourth RR is optically coupled to the fourth NRR at a side opposite to the third PBS.

19. The device of claim 14, further comprising:

an input optical port optically coupled to the first PBS at a side opposite to the first set of optical rotators;

a drop optical port optically coupled to a face of the first PBS at a side opposite to the

second RI;

an output optical port optically coupled to the second PBS at a side opposite to the first set of optical rotators; and

an add optical port optically coupled to the third PBS at a face not intersecting the second axis of the device.

20. A system, comprising:

an optical network, the optical network comprising a composite optical signal; and

an optical device, the optical device comprising:

a first PBS,

a first set of optical rotators optically coupled to the first PBS at a face intersecting a first axis of the device, the first set of optical rotators comprising a first NRR and a first RR,

a second PBS optically coupled to the first set of optical rotators at a side opposite to the first PBS,

a first RI optically coupled to the second PBS at a face intersecting a second axis of the device, wherein the second axis is not parallel to the first axis,

a second RI optically coupled to the first PBS at a face intersecting a third axis of the device, wherein the third axis is not parallel to the first axis,

a second set of optical rotators optically coupled to the second PBS at a side opposite to the first RI, the second set of optical rotators comprising a second NRR and a second RR,

a third PBS optically coupled to the second set of optical rotators at a side

opposite to the second PBS, and

a third RI optically coupled to the third PBS at a side opposite to the second set of optical rotators.

21. The system of claim 20, further comprising:

an input optical port optically coupled to the first PBS at a side opposite to the first set of optical rotators;

a drop optical port optically coupled to a face of the first PBS at a side opposite to the second RI;

an output optical port optically coupled to the second PBS at a side opposite to the first set of optical rotators; and

an add optical port optically coupled to the third PBS at a face not intersecting the second axis of the device.

22. The system of claim 20, wherein the optical device further comprises:

a third set of optical rotators optically coupled to the first PBS and the second RI, the third set of optical rotators comprising a third NRR and a third RR.

23. The system of claim 22, wherein the optical device further comprising:

a fourth set of optical rotators optically coupled to the third PBS and the third RI, the fourth set of optical rotators comprising a fourth NRR and a fourth RR.